to these segmental organs. In his so-called 'Comparative Anatomy' he speaks of the possibility of a comparison of the oviducts and tubæ to the segmental organs of the Vermes. This is completely refuted by the observations here given: the true segmental organs of the Vertebrata (hitherto detected only in the Selachia) have nothing to do with the tubæ and the oviduct; the former originates from the primitive renal duct, and the latter is produced by a fold which finally leads to the formation of a tube; the tubæ are only the permanently open orifices of the primitive renal groove, and they consequently originate in quite a different manner from the true segmental funnels.

The comparison here made leads to far-reaching consequences. Assuming it to be correct, it follows that the Annelida are more nearly allied than the Ascidia to the Selachia, and therefore also to the Vertebrata in general (with the exception of *Amphioxus*). It might be objected that the spinal cord and the chorda are of more importance for the recognition of relationship than the primitive kidney and the segmentation of the body, so that the Ascidia are more nearly allied than the Vermes to the Vertebrata. But this objection is partly refuted by the circumstance that according to Kowalevsky's investigations the ventral cord of the Vermes and Insecta is formed in a perfectly analogous manner to the dorsal cord of the Vertebrata. The chorda alone seems to offer any difficulty; but it is still questionable whether the chorda of the Ascidia is really to be compared so unconditionally to that of the Vertebrata; and, on the other hand, Kowalevsky, in his 'Embryological Researches on Worms and Insects,' even indicated as a chorda a fibrous cord discovered by Leydig in the earthworm and detected by Claparède in numerous worms, and which in its origin and position between the ventral cord and the intestine exactly resembles the chorda of the Vertebrata. Nevertheless the histological structure of this cord is essentially different.

If the embryo of an annelide be turned so that its ventral surface lies upwards, its section presents exactly the same arrangement of the organs as in the Selachian embryo. Consequently, by the discovery of the segmental organs, the belly of the annulose animal is identified with the back of the vertebrate. This is not the place to trace this conception to its further consequences; in this respect, as also with regard to the detailed proof of the facts given above, reference must be made to a more complete memoir which will appear shortly in the second volume of the 'Arbeiten aus dem zoologisch-zootomischen Institut in Würzburg.'—*Centralbl. für die med. Wissensch.* 1874, No. 35.

Würzburg, July 1874.

Segmental Organs in adult Selachia. By C. Semper.

I can now follow up my former preliminary communication on the occurrence of segmental organs in Selachian embryos with a further statement that such organs may also be very easily detected even in adult animals, but only in fresh or very well-preserved

specimens. The Selachian genera in which I have regularly found them in sexually mature adult individuals are as follows:—*Squatina*, *Scymnus*, *Centrophorus*, *Spinax*, *Acanthias*, *Hexanchus* (in a specimen 10 feet long), *Pristiurus*, and *Scyllium*. In the last genera they are very small, and for the most part also altered; on the other hand, in *Scymnus* and *Squatina* they are exceedingly large, furnished with distinct funnel-shaped apertures, into which fine forceps may be conveniently introduced, and are present high up on the sexual fold. In *Squatina* especially these organs are so numerous, regularly developed, and striking even in the living animal, that it is quite incomprehensible to me how they can have been hitherto overlooked. The following genera are destitute of them when adult—*Lamna*, *Mustelus*, *Galeus*, *Carcharias*, and probably *Sphyrna*; when they disappear, or whether they occur at all in the embryo, still remains to be ascertained.

In my first communication I indicated that perhaps the seminal ducts originated from the segmental funnels. This is decidedly not the case; but, on the contrary, it seems probable, especially from their behaviour in *Squatina*, that the segmental ducts may become the *vasa efferentia testis*; and by a growth of the epithelium of the segmental funnels the epigonal organ may perhaps be produced. In favour of the supposition that the primitive renal duct becomes the seminal duct we seem to have the two facts:—that in large male embryos only a single canal is to be found, which subsequently becomes the urino-seminal duct; and, secondly, that a tuba occurs in the males of all genera of Rays and Selachia, and passes on each side into a canal exactly as in the females, and this evidently can be nothing but the anterior end of the primitive renal duct. The middle tubal orifice of the males is very large in many genera (*Scymnus*, *Centrophorus*, *Squatina*); the canals running backwards from it (representing the oviducts of the female) are very soon obliterated, and cannot be traced as such to the kidneys in the genera which have hitherto been investigated. In a few species, only a fine cord, but without a cavity, was recognized between the kidney and the hinder extremity of the male tubal canal. Careful investigations of the embryos have proved, however, that the permanent urino-seminal duct of the male is not the primary primitive renal duct, and that the latter disappears almost entirely in the region of the kidneys, whilst, as in the females, a secondary primitive renal duct has been developed as a urino-seminal duct. This is the case also in *Chimæra*. In the males of this species there are two isolated tubal openings which lead into a fine canal lying upon the urino-seminal duct; this corresponds in position to the oviduct of the female, and can be nothing but the primary primitive renal duct. By this *Chimæra* approaches much more closely to the Ganoids than to the Plagiostomi.

I hope soon to be in a position to follow up my first memoir, which has already been referred to and will shortly appear, on the segmental organs of the Selachia and the relationship of the vertebrate and invertebrate animals, with another on the urogenital system of the Plagiostomi.—*Centralbl. für die med. Wissensch.* 1874, no. 52.

Würzburg, Oct. 1, 1874.